N.A.C.A. BULLETIN

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MARCH 1, 1949

RELATIVE PROFIT MARGIN APPROACH TO DISTRIBUTION COSTING

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The author of this article proposes to relegate to an auxiliary position the detailed development of unit cost of functions, often thought to be the most significant means of approach to informative analysis of distribution costs. In its place, he would elevate profit and loss statements by districts, salesmen, products, or other area of study. These statements, except (to some extent) for products, would stop at the point at which cost allocations would otherwise have to begin. Objective: COMPARABLE *rather than* NET *results.*

PRODUCTION without a distribution mechanism makes no sense and we all view with alarm the accumulation of merchandise in warehouses. Products must be kept moving out of the consumer's end of the pipe-line if they are to continue to pass through the intake of the production processes. Now, as the pipelines are filling, more and more emphasis is being put upon distribution so that there will be no stopping of the flow. This is as it should be. It is competition at work, and it is a paradox of this free enterpirse system that expenditures for distribution tend to reduce total costs. This is in marked contrast to the rigidly planned economy where there is precious little use for that familiar figure, the salesman.

Discerning the Objective of Distribution Cost Analysis

The problem of distribution costing resolves itself simply into this: how much is enough? This will be the burden of our song as we discuss the subject. In preparation for this paper, I read and reread the wealth of material on the subject. I learned that distribution costs should be determined by function and then should be related to an activity factor applicable to the respective function and reduced to unit costs. These unit costs should then be compared by salesmen, territories, etc., for information and control. The mass of analytical detail through which I was taken in the course of my reading was very impressive. I had to stop and think. Did it contain the answers? Certainly what was proposed

comprised good cost analysis but it seemed to me that it was not brought into focus. In trying to organize the detail, I asked myself: Why do we analyze costs? To control and reduce them. Why do we want to control and reduce them? To maintain or increase profit margins. And there it was, the beam of light in the darkness—the one basic measurement of the effectiveness of expenditures for distribution activities is the profit margin resulting therefrom.

Recognition of this truth will be a significant development in distribution costing. Therefore, in this article we are to consider:

1. The why and how of relative profit margins.
2. The use of relative profit margins in distribution cost management.
3. The correlation of other distribution cost techniques with the relative profit margin approach.

Because of space limitations, we shall have to limit the scope of our discussion to distribution activities of manufacturers, avoiding the wholesale and retail fields.

The Why and How of Relative Profit Margins

Measuring the effectiveness of expenditures for distribution activities through comparisons of profit margins is not a complete departure from normal current distribution costing practice. Rather, it is a simplification of costing techniques and the realization of the ultimate from the accumulation of a minimum of cost statistics.

Contrasts Between Production and Distribution Costing

It must be recognized that production costing and distribution costing are two entirely different procedures. In the factory we have either specialized trades or standardized production methods. In either case, production expectancies can be established within reasonable limits. Given a quantity of material and working instructions, an experienced factory worker can be expected to turn out a specified number of processed units in each eight-hour day. Here men are working within a prescribed area with tangible things—machines and materials. Further, time and production clerks are assigned to record the materials received, the time expended, and the production turned out. All circumstances are con-

ducive to accurate recording of measurable work, and substantially accurate unit costs are secured.

Contrast this with the distribution activity. There are no standard procedures for the most costly phases of activity, field sales effort and advertising. Results are dependent upon the skill of the salesman, the credit manager, the copywriter, and the creative artist. In addition, they are bringing those skills to bear upon the most unstandardized and unpredictable force in all the world—human nature. Activities are such that they cannot be observed and measured by a clerical force. Does it not seem that we have tried to go too far in developing unit costs for distribution functions?

In Pursuit of the Facts: The Case of Algerian-American

Cost per call is frequently set forth as one of these unit costs to be established. But what is a call? If the salesman has called upon the Jones Company and found the purchasing agent was not in, was that a call? You might say, no, let us eliminate that and consider only productive calls. But, what is a productive call and who decides that it falls into that category? I do not believe the salesman will record many nonproductive calls, for his innate optimism will lead him to consider all contacts productive to a degree.

Let us look at a specific case which may help to illustrate the fallacy of unit distribution costs. A manufacturer of closures has a display booth at the annual convention of the Wine and Spirits Institute. It is a good promotional display and attracts many visitors. One of these is Reneé Bordeau, managing director of the Algerian-American Wine Company. One of the sales managers at the exhibit meets Mr. Bordeau and, recognizing the importance of Algerian-American in the industry and knowing that they are not a customer of the company, invites him and his purchasing agent, Paul Murray, to lunch. Since Algerian-American is in the New York district, word is passed on to that office of the contact and salesman Frank Pearce is assigned to develop the account. Pearce calls upon Algerian-American, meets Messrs. Bordeau and Murray and learns that they are planning to market a new wine and, of course, a new wine means a new bottle and a new closure for the bottle. Here is business with a real potential.

So Pearce passes the story on to the home office and suggests that the design department prepare a model of a custom-molded plastic closure for the new wine bottle. When the model is received, Pearce calls on Algerian-American and extols the advan-

tages of a distinctive custom-made cap. He works with them for a half day on package design but no decision is reached and he leaves. Several days later he calls back and, after a lengthy discussion, Algerian-American admits that the cap is wonderful but the price of the wine simply will not permit its use.

Plastic and Screw Cap Sales Effort Sells Corks (and Crowns?)

Pearce is not stopped with that. His company also makes metal screw caps and he immediately points out the superior value of these. At least it would have the Algerian-American trademark lithographed on it. From his sample kit, he produces color combinations and on the spot develops a very attractive closure. But again, Algerian-American does not want that and finally Mr. Bordeau says, "Mr. Pearce, we cannot buy the molded cap and we cannot buy the metal cap, but for your kindness we are giving you an order for 500,000 first grade wine corks."

Well, Pearce was elated. He had cracked a new account. So, on leaving the building, he dropped in to make a golf date with the purchasing agent of Burpy Bottlers who had offices in the same building. Not only did he get the golf date, but he also booked an order for ten thousand gross of crowns. Not a bad day's work.

Let us try to analyze for distribution costing the situation we have just covered. There was general sales promotion effort, i.e., the display at the convention. There was entertainment, which required time and could be considered a call. There was customer service in the designing of the custom-molded cap. Pearce made three sales calls of varying length, the first general and the other two to sell molded plastic caps. He actually sold corks and incidentally sold some crowns—or was that golf date situation a call? It is quite an involved sequence, but it certainly is not unusual.

Suppose we say that each contact of Pearce's was a call and add the four to his other calls and divide them into the total of his salary, travel, and entertainment cost, what do we have? An average which would give Algerian-American too low a charge and Burpy Bottlers too much. Cost per customer would be equally erroneous. Well, let us have Pearce send in time reports and charge customers, products, etc., on his rate per hour. But, will he report time on molded caps when the effort resulted in the sale of corks? Your guess is as good as mine. It is just about impossible to work this into intelligible unit cost development and, even if we could get it all set out absolutely correctly, we would have statistics

which might or might not be comparable to those for other men and areas.

All of the foregoing has been included here to point up a fact, and that fact is that you cannot standardize your distribution activity. One writer has said, "Arrive at standards on every element of distribution cost and then control to these standards." I do not think it can be done. I believe the case of Algerian-American which we have just gone over points up the fallacy of unit cost standards for distribution control.

Relative Profit Margin Distribution Costing Procedure

Lacking standards as a measuring stick, we must develop some other. For this purpose, I suggest relative profit margins. Profit is essential in all private business enterprise. It accrues from astute business management and is conditioned by all of the intangibles which are embodied in the concept of management. There is no basis of measuring the attributes of a good business manager but, in the aggregate, he is judged a success or a failure to the degree that he achieves or fails to produce a consistently satisfactory record of profits. Distribution likewise is an aggregate of many components, many of which are in the area of intangibles. The effectiveness of these can best be appraised by comparing the relative profit margins of the resultant sales. Such comparisons may be made by districts or territories, by salesmen, by customer classes, by methods of sale, by branch warehouses, or by product groups. In each instance, we will be giving management information which is in focus. Such comparisons do not require the allocation of all costs to the particular unit (district, salesman, warehouse, etc.) but instead employ those distribution costs which are specific to the unit. The important thing is to get profit margins on a comparable basis rather than an absolute or complete basis.

The first step is the development of sales statistics. Procedures should be developed to accumulate net sales, before provision for cash discount but after trade discounts and all allowances and other deductions, by the unit or units to be appraised. This can be done economically through the use of punched card or keysort equipment, or a pegboard system or other devices, depending upon the volume of transactions. If standard costs are in use the standard cost can be recorded when the sales are recorded. This provides for the summarization of sales and standard cost of sales simultaneously. It has the further advantage of making sure that

the standard cost of every sale is recorded. If standard costs are not in use, the actual cost must be accumulated and applied against each sale. This is not a cumbersome job but is a bit more involved than when standards can be used. The comparison of sales and cost of sales provides a gross margin from which should be deducted the distribution costs specific to the units being studied, to arrive at relative comparable profit margins.

An Example: Comparable Margins By Districts

We can take a specific example. We want to compare the relative profits of our sales districts. We use tabulating equipment and have a standard cost system. Shipments are made from several plants, but the billing and sales statistical functions are centralized in the general offices. As the plants make shipments, they place the unit standard cost on the shipping sheet and extend it by the quantity shipped. The shipping sheet is then sent to the general office and the customer's invoice prepared from it. From here the shipping sheet is sent to the sales statistical section, which also receives a copy of the invoice. The standard cost is transferred from the shipping sheet to the statistical copy of the invoice. A master card, prepunched for customer name, state, city, and district office is taken from the file and sent to the punching section with the invoice.

From these, the complete statistical card is prepared showing, in addition to the data already mentioned, the salesman, sales tax information, plant from which shipped, customer class, method of sale, and invoice and shipping sheet number. All credits and miscellaneous charges are coded and summarized in the same manner. Thus it is possible to determine net sales and standard cost of sales for each district. From the gross profit is then deducted the specific distribution expense of the district and the resultant profit margins are relative and comparable for all districts. The same procedure, from the same basic data, would be followed in establishing comparable profit for customer class, method of sale, and salesman.

A second step is necessary to establish the desirability of warehousing in branch warehouses as against shipping direct from plants. Profits are first determined by deducting from the actual gross profit of shipments from a branch warehouse the costs of operating the warehouse and the freight charges on shipments to it. As an independent operation, the quantities shipped from the

warehouse are priced at the manufacturer's lowest wholesale price, delivered, in that city and the standard cost of sales deducted from that figure. If the resultant profit is less than the actual branch warehouse profit, the operation of the warehouse is justified from the profit standpoint.

Minimizing Allocations of Distribution Costs

In each of the foregoing comparisons, only those distribution costs which were specific to the unit under study were considered. Thus the problem of allocation did not enter the picture at all. However, in the determination of profits by product lines some allocations must be made, for there are few if any distribution costs which are specific to a product. It is here that the unit costs of functions are frequently used but, again looking back to our Algerian-American case, we recall that actual unit costs are not reasonably accurate. I believe that greater accuracy can be attained by making a careful study of the distribution expense *budget* and allocating the budgeted amounts to products. Of course some of this will follow the actual effort experienced, particularly in the sales service functions of credit, billing, and sales statistical work, but when it comes to the big items of cost, the planned effort is usually a better comparable base than actual effort.

Thus, the salaries and travel expenses of salesmen, one of the major items of expense in any distribution cost budget, may be allocated on the basis of the opinion of the sales manager. He builds his sales force with certain objectives in mind and he directs their efforts in those channels. Would their own time reports show a greatly different pattern? Likewise, the second largest component of cost, advertising, is beamed at the promotion of specific products and should be so charged. Having taken care of the large segments of cost, the remaining items are less significant and may be considered as overhead to follow sales effort or allocated on reasonable and generally accepted bases. Here, too, gross profit less distribution costs, in the manner just indicated, provides comparable profit margins.

Relative Profit Margins and Distribution Cost Management

In presenting to management, particularly the sales manager, relative profit margins we are giving them information which is in

focus. Instead of having a mass of cost statistics, each set of which is conditioned by circumstances peculiar to the territory, salesman, branch warehouse, customer class, method of distribution, and product group and therefore subject to question, management has a composite picture in terms of the management objective, a reasonable but satisfactory profit.

Cutting Volume Down to Profit Size

Probably the first effect of such information will be to smash the brazen idol of sales volume as an object of worship. Too often the salesman who brings in the most dollars of sales is considered to be the most effective salesman. I know of one sales manager who keeps a card file of the dollars of business credited to each of his salesmen each month and the high producers have the highest rating in the salary scale. If he had the relative profit margins for these men he might be startled, for experience has shown that just as often as not the high sales volume man is in the lower quartile both in percentage and total dollars of profit. This is not a mystery when we consider human nature. The sales manager wants volume and rates his men according to the volume they produce. Thus volume becomes their first objective. If they must shade price to get the business they will do it—profit does not matter. If there is an opportunity to secure a lot of volume in a low profit line that is easy to sell they will take that rather than spend time on another line which may have less sales volume but more profit potential. If the specialty item that is hard to make is easy to sell because competitors do not like to make it, the salesman, if only volume-minded, will take the specialty business and let the competitors have the standardized products.

This emphasis on volume provides no incentive for holding down distribution expenses nor for producing profitable business. However, if we are going to measure on relative profit margins the salesmen must be given information on these so that they can work intelligently. Relative profit margin reports then become a tool of distribution cost management.

Again, if there is a compensation plan based on sales volume, the problem of volume versus profit is multiplied many times over. It is generally recognized that sales compensation is a vital sales management tool. But tools can be good or bad—they can be instruments of construction or destruction. Straight commission plan or salary plus commission on volume plans can destroy the

best sales program. On the other hand, if salary incentives are based on the profit margin of the salesman, it will naturally encourage him to carry out the programs and policies which will lead to the achievement of management objectives and sound business operation.

Decisions as to Desirable Sales Areas

Another area of use of relative profit margin is in establishing sales territories. National distribution is a wonderful thing—if you have a product which lends itself to national distribution from *your* plants. Here again volume frequently becomes the dominant factor with no consideration given to the cost of securing that volume. The recent "cement decision" may have some effect on this, for customers may not be willing to pay freight which was formerly absorbed by manufacturers. However, notwithstanding the "cement decision," there is still a lot of freight absorption. This is reflected in relative profit margins but not in gross sales volume. Then, too, there is the cost of supervising field sales effort in areas well removed from the home office. If there are no other differences, at least the cost of maintaining contact is greater. This applies not only to sales supervision but to placing orders with the home office, checking credit, following up on orders and deliveries, and making adjustments. All of these are reflected in the relative gross margins of the territories. They are *not* revealed in sales volume statistics, nor in unit costs by functions.

Selection of Product Lines

Product selection and pricing is still another area in which relative profit margins should have an important bearing. The war period was a production era and the production man came into his own. There was no need to sell for there was one major customer and any others were glad for any crumbs which this one did not take. Since the war we have had a market which in some lines still appears insatiable and in the others has only recently found the pipe-lines filling. Under these circumstances, diversification of product lines was a "natural." Were not all sorts of production problems licked during the war? Postwar, anything could be made by anyone and if it could be made, the market was there bidding for it. Prices were high and profit was almost unavoidable. Corporate profits were appraised in the aggregate and were good, but where analyses were made, it was found that umbrellas were being

held over some lines by long profit items. Now we are coming to the end of the lush era and competition will soon lower the umbrellas. Then the weak sisters will be out in the wet, unprotected. Sales management must have the relevant facts and set their product line in order before the day of reckoning comes.

The importance of relative profit margins by product lines is not a new subject with me. I have been working on it for many years. In 1938 I went to England for our company to develop procedures for our subsidiary there to determine product profits. One week end I went to visit a friend of mine in Holland who was in the bulb growing and exporting business. He asked me why I was in England and when I explained the purpose of my visit he thought it rather silly. He said his customers wanted all kinds of bulbs and his business could not be broken down into lines and, if it could be, it would not mean anything for he was interested in his net corporate profit. As we walked through his plant I noticed that different kinds of bulbs were stored differently and packaged differently. Later we talked with his accountant and I began to ask questions about these differences, as well as differences in weight per unit of sales income, which of course was important because of transportation costs. The next time I saw my friend's catalog he had completely changed the emphasis on the items he was featuring. Later he wrote a letter to me and said that they had found they could make more money for the business as a whole by changing their sales mixture. He found that relative profit margin data were not silly.

There are many uses of relative profit margins other than the three I have mentioned. Each industry and each company will have its peculiar problems and it is the accountant's job to sense these and develop the pertinent information to be used in their solution.

Auxiliary Use of Other Distribution Cost Techniques

In attempting to bring distribution costing into focus through the relative profit margin approach, I do not want to imply that this approach eliminates the need for any other distribution costing. Such is not the case for there are many other procedures which may be used with due recognition of their function and their limitations. Probably also, such other procedures will usually be followed as parts of special studies rather than as continuous costing procedures.

The established techniques of determining unit costs by distribution functions have a value and such unit costs may be used in analyzing and explaining differences in relative profit margins. For example, month after month we perhaps find a marked difference in the relative profits of two territories with approximately the same sales potential and product mixture. We secure call records of the salesmen and we study costs per call, along with other data, trying to find a point of attack. To our amazement the territory with the lower profit margin also has the lower cost per call. As a matter of fact, it has the lowest cost per call of any territory. This gives the sales manager a clue and, when all the facts are disclosed, it is found that the salesmen are not taking enough time to develop good profitable accounts. They are spreading themselves thinly over many customers so that, while cost per call is low, all sales service costs are high. Also, and more important, time is not being taken to sell the more profitable items. Here is a situation where the cost per call would of itself have been of no value but, when used with the relative profit margin figures, provides the key to the problem.

A discussion of the effects of distribution costs on sales prices, especially where the Robinson-Patman Act is applicable, is a study in itself. The determination of costs and profits by classes of customers and methods of sale is of prime importance in this area, for it seems that differences in sales discounts can be substantiated only by differences in costs of distribution. Thus the procedures which will provide relative profit margins are adaptable in meeting the requirements for cost data under the Act. Further consideration of this field is impracticable here but it is a subject of major importance in many lines of industry. Then there is the whole field of budgetary control. Here again we are limited to mere mention of it. We can say, however, that relative profit margins provide information for basic policy decisions. Tools are needed to implement these by providing daily close-up measures of adherence to the policies. The expense budget aligns the expenditure phase of this, by responsibility, and provides for control through comparison with predetermined plans.

Conclusion

Distribution is bringing persuasive forces to bear upon masses of people to induce them to buy products, and then requiring the

seller to deliver and collect for what the customers were induced to buy. Most of the distribution functions do not lend themselves to the same costing techniques as are used for production. These techniques may be used to develop unit distribution costs but the entire process must be brought into focus. This can be done by determining comparable relative profit margins by territories, salesmen, customer classes, methods of sale, branch warehouses, and product lines. Management can use the relative profit margins effectively in setting policies and correcting unsatisfactory situations. In this light the unit costs and expense budgets become means of implementing the approach which has been made through relative profits rather than ends in themselves. Distribution is different from production and, therefore, the costing processes are also different. Our costing techniques must be adapted to the purposes they are intended to serve and will be judged on how well they do that.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, March 15, 1949

The Auditor and Standard Costs

by George W. Lafferty

A Case Study in the Budgeting of Airline Revenue, Expense, and Capital Outlay

by Henry McGrew

THE FLEXIBLE BUDGET FOR COST CONTROL—HOW DO WE START?

by WILLIAM C. WICKENDEN,
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In practical and logical vein, the text and exhibits making up this paper carry the reader through the preparatory steps of flexible budgeting to the point at which costs have been broken down for behavior determination over the desired volume range and have been recombined to provide the whole picture of relationship to output volume. Graphic and mathematical methods in which to express the results of the process are described and related.

CONSIDERABLE emphasis has been given in accounting literature in recent years to the subject of budgetary control and its importance as a tool toward efficient plant operation. Quite naturally the subject matter has been concerned largely with the objectives and potential savings that are implicit in such a system and the reader is left to visualize as best he can how such a device could be worked out in his own particular plant. In this article an attempt will be made to fill in the gaps and outline an approach to the problem of preparing the basic data in a manner which will have a practical application in most manufacturing plants.

Need for Measuring Stick to Achieve Control of Costs

To accountants it is a truism to state that absolute statistics in themselves are meaningless. To hand to a superintendent a mere statement of his actual departmental costs, even though carefully broken down into their various components, is to add one more sheet of paper to the wastpaper basket for the simple reason that he has no idea whether what the statement shows is good or bad. What he wants is some kind of a measuring stick to tell him what his costs should be which, in the final analysis, usually takes the form of past history. How to trap this rather elusive and nebulous thing we call "experience" into a precise mathematical formula is the problem which confronts the accountant in his efforts to determine what his costs should be. This problem is basically the core of all cost control.

Accountants have devised several approaches to this problem,

each of which is useful depending on what is to be accomplished. Four such mechanisms might be listed as follows:

1. Comparison of present with previous actual costs.
2. Comparison of actual and standard unit costs.
3. Fixed budgets through which we look ahead and try to anticipate our future sales, costs, and profit margin.
4. Flexible or variable budgets in which we try to set up a formula which will tell us what our costs should be at any level of activity.

While each of these devices has advantages and disadvantages, what we are primarily concerned with in this discussion is control of costs through flexible budgets. In Exhibit 1 is illustrated the type of statement which our company issues each month for practically every department in the plant, including sales and indirect departments such as planning and methods engineering. These statements are issued as soon as possible after the closing of the books each month and are basically a comparison of the actual costs of the period against our budget allowance for the volume of production for that month. Following the principle of exceptions, this analysis provides the management and production personnel with a simple statement from which they can tell at a glance which costs are about as they should be and which are out of line.

Use of "Scattergraphs"

How do we go about setting up such a budget and where do we get the basic data? The usual approach is to analyze our past history of actual costs and from that to set up an equitable standard, taking into consideration changed conditions and the current situation. For this purpose our company has come to use almost entirely what are called "scattergraphs." Now, to many people, charts are anathema and fall into the category of statistical abracadabra such as elimination of cyclical trends, method of least squares, etc. They remember the wisecrack definition of the statistician as one bent on tracing his way from an unwarranted presupposition to a premeditated conclusion. Actually these charts are an extremely useful and simple device which anyone can use without any knowledge whatever of statistics. Shown as Exhibit 2 is the kind of graph to which we refer.

The bottom horizontal scale shows the units of production, the vertical scale the dollars of cost, and the cross marks represent past

DEPARTMENT BUDGET REPORT

Department 24 Allowed hrs.: 14,983—Period: December, 1948

	Month of December (5 weeks)			*Year to Date*	
	Budget	*Actual*	*Variances*	*Actual*	*Variance*
Direct labor	$16,781	$16,394	$ 387	$165,765	$4,324
Indirect labor					
Supervision and clerical	1,399	1,335	64	14,513	130
Utility labor	1,129	1,067	62	11,992	— 434
Misc. indirect labor	15	....	15	16	132
Total indirect labor	2,543	2,402	141	26,521	— 172
Expense					
Misc. supplies	120	97	23	2,075	— 844
Welding supplies	524	1,169	—645	6,836	—1,408
Spoiled work	24	38	— 14	498	— 280
Misc. expense	33	....	33	210	122
Repairs to tools	584	920	—336	8,404	—2,400
Repairs to equipment	285	231	54	3,912	— 978
Credit for scrap sales	—237	—247	10	—3,463	— 50
Total expense	1,333	2,208	—875	18,472	—5,838
Total controllable	20,657	21,004	—347	210,758	—1,686
Fixed cost					
Depreciation on tools	35	35	....	364	....
Fixed charges on equipment	575	575	....	5,980	....
Rent for building	1,750	1,750	....	18,200	....
Total fixed	2,360	2,360	....	24,544	....
Grand total	$23,017	$23,364	$—347	$235,302	$—1,686

Check on budget allowance

14983 x 1.3392 excess rate	= $20,065	Variable
590.50 fixed per week x 5 weeks	= 2,952	Fixed
Total as above	$23,017	

EXHIBIT 1

history plotted in against both of these scales. The next step is to draw a line which will pass through the bulk of these points or so that the points on both sides of the line about balance each other out. Any points which obviously do not conform to the general pattern, such as the four indicated on the chart, are probably abnormal and should be ignored in setting the line so that this history will not be incorporated as part of our standard.

Exhibits 2, 3, and 4 indicate three different types of cost: the direct variable, the semivariable, and the fixed. In the first case,

Scattergraph - Direct Variables
Department 24
Direct Labor
$ Per Week
3000
2000
1000
0
500
1000
1500
2000
2500
3000
1250
Normal
Units of Production (Allowed Hours)
2360/3000 = $1.120 Excess rate per allowed hour
1400/1250 = $1.120 Standard cost per unit at normal
Other direct variables which can be similarly budgeted: Materials, supplies, repairs to production equipment, power

Exhibit 2

the line starts at zero, indicating that the cost varies in direct ratio to production or, in other words, that the cost per unit is constant regardless of the volume of production. In the case of the semivariable, the line does not start at zero, which indicates that this type of cost is composed of two elements, i.e., the fixed portion and a variable portion. In other words, there is a cost which would exist even if the department were not operating, which naturally means that the unit cost is always different depending on the volume produced. We might look upon this chart as being a composite of the first chart, or the direct variable, and the third chart which pictures a strictly fixed type of cost. A chart of a fixed cost would naturally be a straight horizontal line.

These lines actually represent the variable budget allowances and all we have to do to obtain the dollars allowed at any level of production is to read it off the chart by taking a point on the line for the number of units of production and reading the dollars from the left-hand scale. However, this represents a rather cumbersome procedure for obtaining our budget allowances, so we prefer to express these lines as a mathematical formula which will allow us to calculate the allowance instead of reading it off the chart.

The "Excess" or Variable Rate and Isolation of Fixed Costs

To accomplish this, we work out what can be called an "excess" rate which tells us how much additional budget allowance is to be given for each additional unit produced. In the case of the direct variable, the excess rate and a standard unit cost are identical as, by definition, the unit cost is constant. This can be seen from the calculations on Exhibit 2. In the case of the semivariable, the budget formula consists of two parts, an excess rate for the variable portion and a fixed dollar allowance for the fixed portion as indicated on Exhibit 3. We really do not need a chart for the strictly fixed costs as shown in Exhibit 4 as we know what this cost is already. The summarization of these excess rates and fixed costs is shown on the first two columns of Exhibit 5. In the last two columns is shown the determination of the standard unit cost for inventory valuation and cost statistics. These can be calculated from the same charts on normal volume.

The budget allowance for the month of December 1948 is shown on Exhibit 1. It will be seen that the budget formula is set up on a weekly basis. The month of December we consider as having five weeks. The number of units produced during this

Scattergraph - Semivariables
Department 24
Supervision
$ Per Week
300
200
100
0
500
1000
1500
2000
2500
3000
1250
Normal
Units of Production (Allowed Hours)
280-100 / 3000 = .0600 Excess rate per allowed hour
175 / 1250 = .140 Standard cost per unit at normal
Other semivariables which can be similarly budgeted: Utility labor, watchmen, timekeeping, planning, sweeping and cleaning, group insurance, factory vacations and pensions.

EXHIBIT 3

month was 14,983. If we multiply this number of units by the excess rate of $1.120 for direct labor, we get the allowance of $16,781 as shown. In the case of supervision, we multiply 14,983 by the excess rate of $.0600, which gives $899, and add the $100 fixed cost per week times five weeks for $500, giving a total of $1,399 as shown. The fixed cost is the per week cost times five.

One important feature of this system is the mathematical check for the total as shown at the bottom of Exhibit 1. Where the budget allowance has to be read from the chart, the value of this checking mechanism is lost and this factor should be borne in mind when there is a temptation to set up a curved line or step chart which would make mathematical calculation of the allowances impractical.

We have now seen how these charts can become the basis of the determination of mathematical formulas for calculating budget allowances for any level of production. The really significant feature of this system is that it provides a practical approach to the problem of isolating the fixed element in the semivariable costs. When a representative period of history is charted for a cost like supervision, a line is drawn through the points and at some point the line will cross the left-hand scale. This will tell what cost is at zero activity or when the department is not operating. This amount can then be studied and if it is about what common sense would say is logical, it provides a positive figure to work from instead of a guess.

The charts, hence, can give a birds-eye view of several years' history, the general pattern of the cost being studied, the separation of the fixed and variable portions of the cost, the amount of variance from standard for any period plotted, and any abnormal results which may have occurred during the period studied. It has been our experience that one such simple chart will replace several volumes of worksheets on which unit costs and variances have been tabulated.

Importance of Equitable Basis for Measurement of Activity

The key to the success of any such budget plan lies in the selection of an equitable basis as the measurement of activity. It will soon be apparent that there is no universal yardstick and that each department has to be studied individually. The one basic essential is that the yardstick has to be a constant common denominator which measures departmental activity. It cannot be a shifting

Graphic Presentation - Fixed Cost
Department 24
Rent for Building
$ Per Week
600
400
200
0
500
1000
1500
2000
2500
3000
1250
Normal
Fixed Cost $350
350 / 1250 = .280 Standard cost per unit
Units of Production (Allowed Hours)
Other fixed costs which can be similarly represented: depreciation, fire insurance, taxes, maintenance, etc., on land and buildings.

STANDARD BUDGET FORMULA
WEEKLY BASIS

Standard unit: Allowed hours
Units at normal: 1250

	Fixed amount	Excess rate per all'd hr.	Department #24 Standard cost Per week	Per all'd hr.
Direct labor		$1.1200	$1,400.00	$1.120
Indirect labor				
Supervision	$100.00	.0600	175.00	.140
Utility labor	18.50	.0692	105.00	.084
Misc. indirect labor	....	.0010	1.25	.001
Total indirect labor	118.50	.1302	281.25	.225
Expenses				
Misc. supplies		.0080	10.00	.008
Welding supplies		.0350	43.75	.035
Spoiled work		.0016	2.00	.002
Misc. expense		.0022	2.75	.002
Repairs to tools		.0390	48.75	.039
Repairs to equipment		.0190	23.75	.019
Credit for scrap sales		—.0158	—19.75	—.016
Total expenses		.0890	111.25	.089
Total controllable cost	118.50	1.3392	1,792.50	1.434
Fixed cost				
Depreciation on tools	7.00		7.00	.006
Fixed charges on equip.	115.00		115.00	.092
Rent for building	350.00		350.00	.280
Total fixed cost	472.00		472.00	.378
Grand total	$590.50	$1.3392	$2,264.50	$1.812

EXHIBIT 5

basis such as might occur if you used labor dollars, for wage rates shift from one period to another, or sales dollars for there will be price increases. The requirement for corrections for these factors is thus imposed to make allowances so based uniform throughout.

The ideal basis is some unit which eliminates the dollar sign. This may be tons, number of pieces, or machine or labor hours. These are physical measures. It may not always be practical to use such a measure where the department produces a great variety of products and it may become necessary to use some dollar factor to get any kind of a common denominator. The selection of a basis of measuring the productivity of individual departments can often be highly troublesome and it may be necessary to provide for the compilation of figures just for this purpose. However,

there is nearly always a basis which can be found and it is only by study of the particular department that any selection can be made.

In the example shown in the charts, the measurement used was "allowed" hours. The department is one of the operating sections of a machine tool manufacturer which produces about 25,000 different parts. Each operation to be performed is rated by the methods department and so many hours are "allowed" for each job. This is the basis of payment to the operator regardless of his actual time. It is, in effect, a piece rate, but the summation of these allowed hours gives a common denominator to measure the department's activity even though no two operations are alike and the total for the plant gives what is called the over-all shop activity which tells the rate of production for the entire plant.

Going Back to Prewar Costs for Experience Data

Another essential is that the past experience chosen as a basis for study be long enough to get a representative picture of what the standard should be. If possible, it is desirable to include a low activity period such as 1938 and a high activity period in order to obtain a picture of the behavior of each cost in turn at varying levels of activity. Our experience has been that we have to ignore the war years for all practical purposes because of the emphasis on production and the almost complete disregard for cost control during that period. If only the postwar years are used there is danger of incorporating into the standard many of the inefficient practices adopted during the war and still continued, although not essential according to prewar experience. Thus, to get a really representative period, it is desirable, if possible, to go back to the more normal operating conditions of 1936 through 1941.

If it is practical to plot this prewar history and also current experience, it may incidentally offer quite a revelation as to how far current costs are out of line with the past. Before any true comparison can be made, it will be necessary to increase prewar costs by wage and price increases which have taken place, in order to get comparable data.

A good approach might be not to allow increases in a budget which prewar experience would indicate unless there is an adequate explanation for its necessity. The experience in our plant has been that many such budget allowances, set on prewar history adjusted for wage increases, appeared to the operating personnel as im-

possible of attainment when set. Yet many of the foremen who expressed this opinion are operating in the black on these allowances today after making a concerted effort toward cost reduction.

Costs Which Behave Alike

Listed at the bottom of the charts are some of the costs which usually behave in the same manner as the example charted. The most nearly absolute direct variables are materials and direct labor, especially piecework, as in these cases the amount in input is in direct ratio to the output of product. It has been our experience that even day work direct labor is a direct variable, the efficiency and the average wage rate acting as compensatory factors. In periods of low volume, the force is composed of the oldest and most efficient employees but at a high average hourly rate, whereas at high volume green help has been added with a lower wage rate.

Repair costs on production equipment will fluctuate widely from one period to another, making it difficult to ascertain the general pattern. However, if long enough experience is taken, it usually works out that over a long period of time maintenance costs can be considered as directly variable with production.

Supervision is the most common example of a semivariable in which the cost does not increase or decrease in direct ratio to production. The usual argument is that supervision should be pictured as a step chart which would reflect each addition of an assistant foreman as production levels advance, and no doubt this is the true behavior of this type of cost. We have found, however, that over a period of time, just as accurate results can be obtained with the straight line as pictured in the present chart. It is often difficult to determine accurately at exactly what point another foreman would be added and, in addition, the step chart approach complicates (as indicated before) computation of the budget which we have tried to preserve in order to have a mathematical check for the total.

Also listed as semivariables are some of the costs such as planning, timekeeping, etc., which are in the nature of indirect costs. The usual difficulty in budgeting this type of cost lies in the selection of a yardstick to measure the volume of departmental output. This is often not easy and may require some over-all plant production factor, but there is usually some equitable basis. It is particularly desirable to budget this type of cost if at all feasible. It has been our experience that these departments are far out of

line with prewar experience and hence provide the greatest potential reduction in cost through detailed analysis.

Strictly fixed costs are usually similar to depreciation, rent for buildings, etc. We make no attempt to budget these costs as no element of control can be exercised by the foremen. We do include them on the monthly statement as we usually use such statements for reference on total actual costs and also we like the foreman to have an idea of the value of the equipment he has under his jurisdiction.

Beyond Control of Costs

We have tried to show the steps that should be taken in preparing the basic data for control of costs through the medium of variable budgets. However, this is only one of the many uses to which this basic budget material can be put. It has also been noted that the same charts can be used in the development of standard unit costs for inventory valuation by calculating budget allowances for selected normal volume.

Other accounting devices for control and other purposes can now be worked out on the basis of the mere fact that in the process preparatory to budgeting, we have isolated the fixed from the variable costs. It is a simple matter to determine the amount of fixed cost for depreciation, etc., but it is not so simple to calculate the fixed element in the semivariables, especially the indirect costs. The method which has been explained and which is illustrated by the exhibits is one practical approach to the problem. By virtue of having this separation, the development of the break-even point, the determination of out-of-pocket costs, and the forecasting of the future profit and loss based on particular estimated sales volumes lie only one step beyond.

There has been described in some detail, in this article, the preliminary steps to the installation of flexible or variable budgets, but emphasis has been placed on the underlying simplicity of the process. However, let no one think that any actual installation is or can be a simple matter. It requires a tremendous amount of detailed study and analysis, department by department. Nevertheless, the time and money devoted to this project will be repaid many times over in the savings made possible.

TOWARD STANDARDIZED PRODUCTIVITY MEASUREMENT—THE TIME STUDY BASIS

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It is the opinion of the author of this article that known time study techniques offer a sound (and needed) basis for standard measurement of worker productivity, which will transcend—at least in some degree—the boundaries between companies and industries. Examples are given in support of the position that training in time study work reduces to reasonably narrow limits the disparities in performance rating which may be due to the varying judgment of different individuals in the same or different companies or lines.

OUR present standard of living is far below the level that we should have and can have. If all industry and business used the best management methods and techniques available, we could attain a level of output of goods and services now undreamed of by most people. We all want more and better things at the lowest possible cost, but to get them we must have greater productivity per man hour. This does not mean that people will have to work harder physically. It does mean that management and labor both will have to use their ingenuity and inventive ability to develop better work methods, perfect better equipment and machines, and improve the design of products to reduce the number of man-hours required to make the product. Stop-watch time study holds the answer to the question, "What is a standard day's work?"

The Importance of Measuring Productivity

Work is largely a combination of mental and manual effort expended in a given period of time. Most factory work and much office work are largely manual in nature, and manual work can be measured with considerable accuracy. The results of work determine its value rather than the energy expended by the worker. It is an individual's accomplishment that largely measures his worth, whether he works for himself or for an employer.

In many organizations time study and standard data are used as the basis for wage incentive plans. A standard day's work is the

amount of work expected of the individual in return for his base rate or his guaranteed hourly wage. When an incentive system is used, workers are paid in proportion to their output beyond the standard. However, whether a wage incentive plan is in effect in an organization or whether all employees are paid a flat hourly wage, many people believe the time has come to measure all labor accomplishment. It is suggested that both the employer and the worker should know what the standard day's work is on the job and both should know each day whether or not the standard has been met.

It has been my observation that nearly everyone wants to know what is expected of him, whether he operates a lathe or manages a department or a plant. It is human nature to want some means of measuring accomplishment. Even in our school system, grades and report cards, prepared at periodical intervals, let the student know how he is doing. If the management does not tell the worker how it wants the job done and what the standard output for the job is, then the worker will devise a method of his own and will determine for himself what he considers a fair day's work. In most cases this is not the best way to solve the problem. Rather, because the measurement of work is such an important factor, it behooves all of us to examine critically the tool that is used for work measurement, i.e., time study.

Time Study Procedures Provide the Basic Data

Time study is the only satisfactory way of determining what constitutes a standard day's work. Of course, the use of standard data and standard time values for carefully defined hand motions and combinations of hand motions is satisfactory, inasmuch as such time values are originally obtained from time study data or from micromotion study data which are adjusted for operator speed. It is highly desirable to use standard data for setting time standards whenever it is economical to compile and validate them. This technique requires much less time for setting standards and the results are likely to be more consistent than when independent stop-watch time studies are made for each job.

Time study procedures are all much alike. An operation to be studied is first broken down into its elements and these elements or subdivisions are timed with a stop-watch. A representative time (in many plants the average time) is selected for each element. The pace or speed at which the person worked while being

timed is noted and recorded. This is usually referred to as "rating" or "performance rating." The rating factor is applied to the selected time and a normal time is obtained. This normal time is the time it should take a person working at a normal pace to do the job. Allowances are then added for personal time, for rest for overcoming fatigue, and in some cases for delays. The result is the standard time for the job. This is usually expressed in minutes per piece or in units to be produced per hour.

How Reliable Can Performance Rating Be?

Of the several phases of this whole process, rating speed or pace is the most difficult, requiring experience and judgment on the part of the time study analyst. We all know that there is a wide difference in the speed at which different people naturally work. For example, some people walk at a slow pace, others at a fast pace. The time required for a person to cover a given distance will vary directly with his walking speed. Speed or pace can be rated. If studies made in 100 or in 1,000 factories and offices showed that the normal walking speed was, say, three miles per hour, we would have a definite standard or base to be used in rating the task of walking.

For the sake of illustration, we will assume that a person walking at a speed of three miles per hour is performing at normal or 100 per cent. Then walking at two miles per hour would equal 66⅔ per cent of normal performance and walking at four miles per hour would equal 133⅓ per cent. We are measuring accomplishment. If the task consists of going from one place to another and if walking three miles per hour is normal or 100 per cent, then without question we can use a percentage rating factor with precision in measuring performance or accomplishment.

The question now arises as to the ability of industrial engineers to judge speed of walking or the speed of doing other physical tasks. We are interested in knowing the answer to such questions as:

1. How much variation would be found if an engineer rated a series of a dozen different walking speeds?
2. How would this same man rate the same walking speeds next week or next month?
3. Would he do better at rating if he received instruction and practice at periodic intervals and, if so, what is the best way he can be given such training?

4. If ten qualified time study men from the same company rated a given operation, how would their ratings differ? If they all made a complete study of the same operation, how would their time standards differ?

In my opinion, these and many other questions should have been answered years ago. Many of us have made sufficient check studies to convince ourselves that experienced engineers can establish satisfactory time standards but, by and large, only generalities are available in the literature to support such claims. I am suggesting to every factory manager and to every head of industrial engineering that if he has not already done so, he proceed without delay to check periodically the procedure used by each of his industrial engineers. I am suggesting that this include not only performance rating but all other phases of time study work.

It is quite possible that performance rating can be standardized in broad areas. For several years I have been conducting surveys to obtain data to answer some of the related questions. To go back to the first point raised above: "How much variation would be found if a person rated a series of a dozen different walking speeds?" In one case, ratings of an industrial engineer on three consecutive days showed a reduction of the systematic error from —11 to —4, and of the mean deviation from 8.6 to 3.4. Average ratings of a group of seven relatively inexperienced time study men, of which the man just mentioned was a member, were then examined. The systematic error was reduced from +5 to —2, and the mean deviation from 11.3 to 7.6. By performance rating practice over a period of four months, the systematic error for walking has been reduced from —13.7 to —2.3, and the mean deviation from 7.6 to 2.4. For card dealing times, the record is much the same, with the reduction in systematic error from +1.8 to +.8, and the mean deviation from 6.2 to 2.4.

Achieving Consistency Through Training—An Example

It may be thought that these operations are too simple to be of much value in industry, and doubt may be expressed as to the ability of experienced industrial engineers to determine time standards of actual factory operations. Data to answer this question can be obtained from time studies made of motion picture films of factory operations, and from simultaneous time studies of actual factory operations made by a group of industrial engineers. A

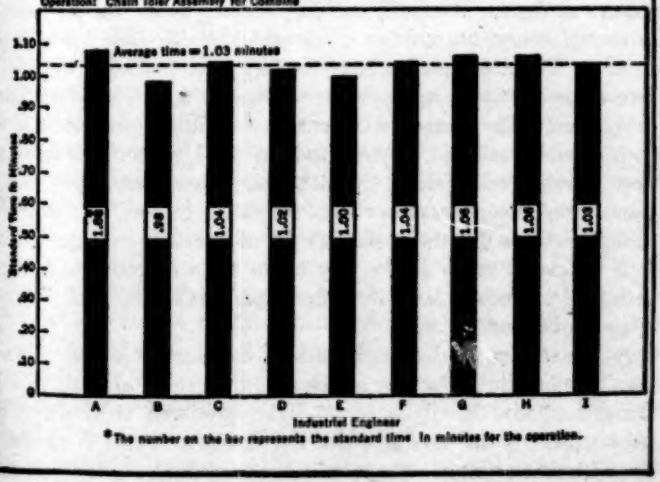
simultaneous time study was made by eleven time-study men of a factory operation. Time study man C set a standard eleven per cent above the average for the group, while B set a standard twelve per cent below the average—an over-all variation of 23 per cent. We would not look with favor on such wide variations in standards. After a series of time study training conferences, a group of nine time study men from the same organization made a study of a typical factory operation. Time study man D set a standard four per cent above the average, while G set a standard five per cent

RESULT SHEET

Operation: Chain Idler Assembly for Combine

Information from Time Study	Industrial Engineer Who Made Study									Averages
	A	B	C	D	E	F	G	H	I	
1. Number of elements	9	7	9	10	9	8	11	8	13	9
2. Performance rating factor	110	105	105	105	100	105	110	110	110	107
3. Personal allowance in per cent	5	3	3	3	5	5	5	5	3	4
4. Delay allowance in per cent	2	2	3	2	2	2	2	2	2	2
5. Fatigue allowance in per cent	2	4	2	5	5	2	3	4	3	3
6. Total allowances in per cent	9	9	8	10	12	9	10	11	8	10
7. Total standard time in minutes	1.08	.98	1.04	1.02	1.00	1.04	1.06	1.06	1.03	1.03

Operation: Chain Idler Assembly for Combine



*The number on the bar represents the standard time in minutes for the operation.

EXHIBIT 1

below the average, or a total variation of nine per cent. The results of this post-training set of studies is illustrated by Exhibit 1. The chart reflects studies made simultaneously of the same operation. Time standards were computed by each engineer independently. All time standards were within plus or minus five per cent of the average for the group. Attention may be directed to the equipment made use of in connection with this set of studies. It included a synchronous motor driven motion picture camera making pictures at exactly 1,000 frames per minute and a projector with calibrated tachometer for showing work measurement films. Pictures can be projected at exactly the same speed at which they were made.

As for consistency among time study representatives from different organizations, I do not have sufficient facts to make a general statement, but I do know that time study men from five different plants have made individual, simultaneous time studies of the same operation and have set piece rates not one of which varied more than plus or minus five per cent from the average. Neither labor nor management can ask for greater consistency than this.

Company Programs for Improving Performance Rating

Some companies run time study clinics for their industrial engineers at regular intervals, not only to keep them "on the beam" in rating ability, but also to check all phases of time study procedure. These companies have in their records today complete time studies of the same operator made simultaneously by all time study men. They have rating curves for film loops which have been standardized and they know what the high and low fluctuations among their time study men are. These companies are, I believe, the exception rather than the rule. In addition, it is not enough to know that the staff is consistent in setting time standards. It is necessary to go all the way to the main objective and to be sure that a standard day's work in the plant is in line with that for other similar industries.

A practical suggestion might be for a company to join with other organizations in the locality to compare time study procedures and rating methods. It will be found highly profitable to have specific information on the level at which time study men rate in comparison with that of other companies in the community. Many organizations make wage rate surveys in order to make certain that they

are paying the going labor rate in the community. It would seem equally important that similar studies be made to determine the amount of work that time study men require for normal performance. It is not enough to have a hunch that performance rates established are satisfactory. A company should have data to show exactly how it stands.

The definition of a day's work should be the same in a factory, in an office, in a restaurant, or in a laundry. It is the same today as it was in 1930—as it will be in 1960. One organization with plants in 55 cities in North and South America is using identical time standards on operations which are the same in all its plants. Many of the standards are originally set in the home office city and are used without change in the other plants. It should be added, however, that a program of motion study and complete standardization of the operation precedes the setting of the performance rate. This particular organization insists that the method used in each of the plants follow the ones prescribed by the main office if the time standard is to apply. In many cases a motion picture film and simo chart are made of the standardized method in the home plant and are sent to the other factories. The industrial engineer in the remote plant uses this information in setting up the job and training the operator in the standardized method.

Envisioning an International Standard Day's Work

The correctness of the average of a group of reasonably consistent studies might still be questioned. Labor might think the number of pieces required per hour too great, while management might believe the number too small. Obviously, we need a national and an international "standard day's work." While we are in the process of getting this, it behooves every manager to work toward a standard for his own organization and to cooperate with other industries in his community in establishing a standard for his locality.

The best possibility, as I see it, for obtaining an acceptable definition of a standard day's work is through the use of motion picture films of typical factory operations. If there were a film library of hundreds of different operations for which a standard rating had been established, these might serve as a bench mark or a standard for comparison and checking purposes, as well as for training industrial engineers in time study technique. Standard data for elements of work as well as for carefully defined motions

and combinations of motions also may be used as bench marks.

At all events, there is real need for progress along the lines indicated if a reliable measure of productivity is ever to exist. The positions which have been taken in this article may be summarized as follows:

1. There is a definite trend toward establishing a standard time for repetitive factory operations, whether a wage incentive system is used or not.
2. The use of standard data and standard motion time values is the most satisfactory way to set a time standard. However, in many kinds of work, the cost of developing such data cannot be justified. Therefore, individual stop-watch time studies must be used.
3. Stop-watch time study and the use of standard data are the only satisfactory methods of establishing time standards for wage incentive purposes.
4. Performance rating is the most difficult part of time study and requires judgment on the part of the person making the study.
5. Reasonable consistency, within and among companies and industries, in time study determinations is a practicable goal.
6. Industrial engineers can improve their ability to set accurate and consistent time standards through a systematic training program.
7. Every manager should cooperate with the industries in his locality in making "time study surveys." He should find out how "normal performance" in his plant compares with the average in other plants in the community.
8. Industry must take the initiative in defining and establishing an international "standard day's work."

COST REDUCTION THROUGH A CONTROLLED EMPLOYEE SUGGESTION PLAN

by A. A. SULLIVAN,
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An employee suggestion system, aimed at cost reduction and making use of both individual and committee effort in an organized way, is described in this article. The author sets forth in considerable particular the methods employed in processing suggestions made and reporting savings realized.

MUCH has been said and written about cost reduction but, of course, the "proof of the pudding" is what is done about it. It might be interesting to look at an actual cost reduction setup which has functioned quite well on a high production job. There are innumerable methods of attacking the problem of cost reduction and it must be recognized that different types of manufacture would naturally require different systems or adaptations if the cost reduction program were to operate most efficiently. The organization to which the present description is applicable is set up for high production and employs approximately 2,300 direct workers. The product manufactured consists of a number of machine shop parts with very close tolerances, as well as assembly jobs.

Groups Originating Cost Reduction Suggestions

The cost reduction program is based on a controlled suggestion system with provision for reporting savings on ideas accepted. Recognizing that real cost reduction is a team job rather than an individual job, five major contributive sources are tapped for this purpose. These five groups and their responsibilities in the program are as follows:

1. *Factory Supervision.* In order to encourage supervisors to contribute their ideas for cost reduction, a special form was made out and several copies given to each supervisor, especially line foremen. This form provides for an explanation of proposed cost reduction projects in such form that each can be adequately investigated by the planning or engineering departments. The form, when filled out, is given to an es-

pecially assigned member of the planning department staff, with the duty of following cost reduction. Each idea is recorded so that follow-up can be made and, eventually, when investigated, a savings reported or rejection explained, so that the ultimate answer on every idea is "yes" or "no." The final answer in each case is given to the cost department for the purpose of recording savings accomplished under its application. The supervisor suggesting the idea is given credit for the saving accomplished. Exhibit 1 shows the form used for supervisory suggestions and ideas.

2. *Engineering.* A list of projected engineering design changes or cost reduction suggestions is recorded and followed through by an engineer designated by the head of the engineering department to follow cost reduction from an engineering standpoint. These are ultimately accepted or rejected and reported to the cost department in either case for record purposes. Since the suggestions are for design changes, they do not pass through the planning department.
3. *Shop Employees' Suggestion* (exclusive of foremen and leaders.) The suggestions are followed by a special representative of the planning department and when the suggestion is accepted, the cost reduction planner reports the final answer to the cost department. We pay suggestion awards for all adopted ideas which result in a lower cost of our product, better working conditions, or an improvement of the product.

SUPERVISORS' SUGGESTION SHEET

Planning Head — Erie Works

The operation which in my opinion will contribute the most immediate cost improvement in my department is described below:

Operation .....

Machine
Prod. Part .....

Description .....

Estimated reduction in direct labor on above:

By: .....
Supervisor

Dept. .....

Date: .....

EXHIBIT 1

4. *Motion and Time Analysis.* Cost reduction accomplished by the motion and time analysis group (time study men) is reported to the cost reduction planner who, in turn, reports these savings to the cost department for formal recording.
5. *Working Cost Reduction Committees.* This group constitutes one of the most effective sources of cost reduction. The organization of the cost reduction committees is essentially as follows:

   The factory is divided into sections (departmental). The committee for each section consists of the engineer following that particular part of the production, the foreman supervising that department, the planner following the planning in that section, as well as a cost staff man who acts as secretary for the committee. The meetings are held bimonthly.

   The suggestions made are recorded by the secretary of the committee and a definite allocation of responsibility made, depending on whether the suggestion involves planning, engineering, factory methods, or materials. When a project is completed and applied, computation of the savings is made by the cost staff, and arrangement is made for formal reporting.

Processing Suggestions and Reporting Savings

The follow through, costwise, of cost reductions from the foregoing five groups may be seen from the more detailed description and exhibits which follow. After the Supervisors' Suggestion Sheet (Exhibit 1) has been turned in to the especially detailed member of the planning department staff, he assigns an item number and makes a record of the suggestion on a methods progress and change record card which carries the complete story of the suggestion up to and after it has been accepted or rejected. This record card is shown as Exhibit 2.

The material, labor, and tool costs are filled in jointly by the cost and planning departments. It should be noted that there is an interim standard space provided for a temporary "change price" until a final "price" has been established. This enables a saving to be reported when actually made and further savings can be reported when the project is finally completed.

This card is given to the cost department (to the cost man who is secretary of the working committees) and after reviewing and

METHODS PROGRESS AND CHANGE RECORD CARD

Item no..... Date.....
Drg. no. .....Part no. .....Division .....
Name of part .....Apparatus .....
Old method .....New method .....
.....
Old standard ..... Estimated standard ..... New standard.....
Yearly prod. ..... Estimated Direct labor and matl. yearly saving ..... Actual Direct labor and matl. yearly saving .....
Tool req. no. .....Cost factor ..... Total net yearly
Date of req. .....Cost of tools .....Direct lab. and matl. savings.....
Remarks or sketch .....
.....
Suggested by: T. S. taken:
Developed by: Date project completed:

EXHIBIT 2

checking when necessary, the savings are reported to management by the cost department. How savings are summarized for this purpose is illustrated in Exhibit 3.

COST REDUCTION SUMMARY

Cost reduction *January 1949*	*Unit # 1*	*Unit # 2*	*Unit # 3*
Unit quantities for 1949	250,000	375,000	180,000
Details of January cost reduction			
Item No. Description			
2.28 Automatic checking equipment for valve plates	.01	.01	.01
8.71 Seam weld instead of spot weld control	–	–	.02
9.88 Work simplification (methods & T. S.)	.015	.015	.015
4.39 New method wire brush and burr frame	.007	.007	–
5.41 Change to less expensive solder on caps	– .015	– –	.02 .015
Total cost reduction per unit for January	.047 ea.	.032 ea.	.06 ea.
Total cost reduction per unit year to date	$.047 ea.	.032 ea.	.06 ea.

EXHIBIT 3

The figures included are illustrative and are shown only to give an idea of how the final summary is made. It will be noted that the summary gives details of savings, with committee number and project number. (2.28 means committee number two and project number 28.

DEPARTMENTAL SAVINGS REPORT

January 1949

Dept.	Item No.		Saving (Qty X Unit Saving) Matl.	Labor	I.M.E.	Total
112	4.24	Weld cases found in press	–	6,000	–	6,000
114	5.2	Use silver solder wheel...	5,000	10,000	500	15,500
124	8.24	Automatic oiler on trolleys	–	–	3,000	3,000
129	10.30	Reduce size shell plate....	10,000	–	–	10,000
Total cost reduction by department			15,000	16,000	3,500	34,500

EXHIBIT 4

Another report is made up for management which shows the savings by cost increment by departments. This enables the progress of each department to be charted and its accomplishments noted. One benefit obtained by this charting of progress is the fostering of competition among departments and the stimulation to greater cost reduction effort. The report referred to results in the presentation of data such as is given in Exhibit 4, which may be graphically represented over a period of months on the form displayed in Exhibit 5.

DEPARTMENTAL SAVINGS—GRAPHIC REPRESENTATION

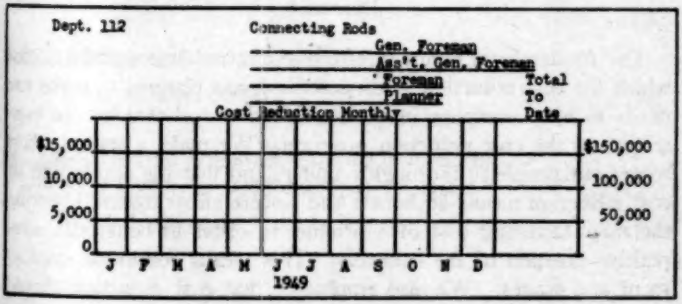

EXHIBIT 5

A Review of the Cost Reduction Setup

It will have been noted that, whatever the source of a proposal, the intention is to have it flow through single points in the planning

or, in some cases, engineering, and cost departments, so that records are clear-cut and easily followed. A cost reduction report is issued each month showing the progress for the month and year to date. Savings on suggestions considered practical are calculated on the basis of one year's output. We have found our management very keenly interested in the progress made by each cost reduction group. As there are constant improvements in machines, processes, methods, and materials, there is opportunity for continual cost reduction in almost all products. It should be here noted perhaps that no cost reductions are reported until they are in actual operation in the manufacturing department.

A summary of the flow of cost reduction reporting, which may help to further clarify the procedure described in this article by showing graphically how cost reduction is regulated to management through the medium of the cost department, is set forth in Exhibit 6.

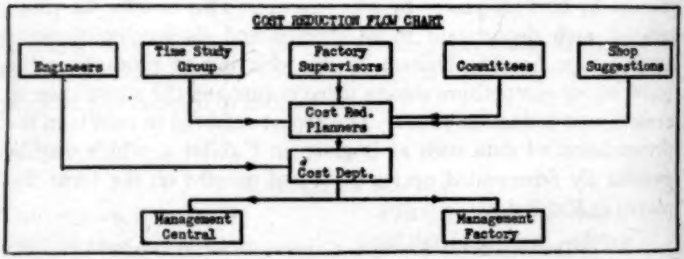

EXHIBIT 6

The fundamental factor in effective cost reduction, and a factor which the cost reduction setup described was planned to make use of, is to have everyone in the organization feel that he can contribute to the cost reduction program. We make a special effort to get our people to thoroughly understand that the application of cost reduction means an honest and sincere effort toward lowering the manufacturing cost of a product in order to better the competitive position of the company. This means continued employment and wages. We also emphasize that cost reduction should never mean lowering of wage rates, directly or indirectly, or the injection of shoddy material into product.